SBC6020 Hardware Manual

Rev. 1.0

Release: 2010-02-03

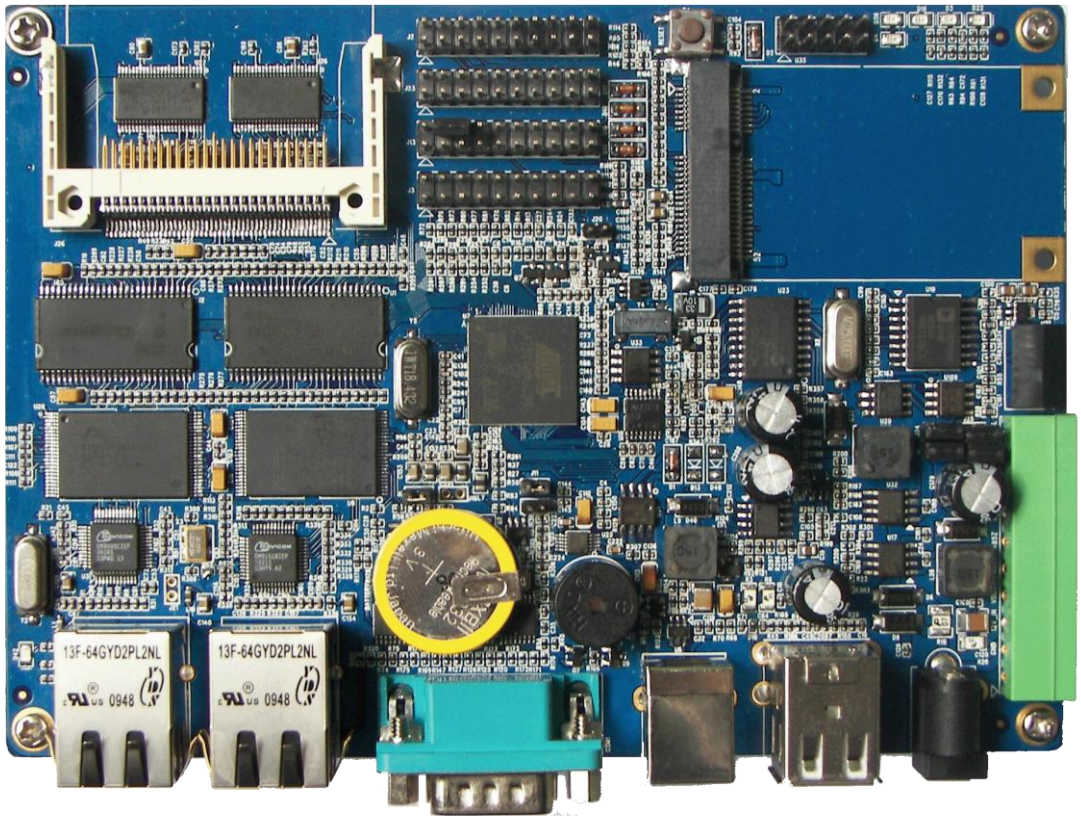
Revision history

Rev	Date	Description
1.0	2010-02-02	Initial version

目 录

SBC6020 Hardware Manual 1
Chapter1 Specifications of Hardware 4
1.1 CPU 4
1.2 Functional interfaces 5
1.3 General system structure diagram 6
Chapter2 Description of interfaces 7
2.1 Interface of Layout 7
2.2 POWER（J14） 7
2.3 USART（J23,J13,J14） 8
2.4 RS485（J14） 10
2.5 CAN （J14） 11
2.6 NET 0（J22） 12
2.7 NET1（J12） 12
2.8 USB HOST（J7） 12
2.9 USB device（J9） 13
2.10 ADC（J13） 13
2.11 CF CARD（J26） 13
2.12 JTAG（J2） 14
2.13 GPIO（J3） 14
2.14 Watch DOG 14
2.15 BUZZ（BUZZ） 15
2.16 TWI（J3） 15
2.17 MiniPCI（J15） 15
Chapter3 Electrical Description 17

Chapter1 Specifications of Hardware



Dimensions of PCB: 150*106*1.6mm

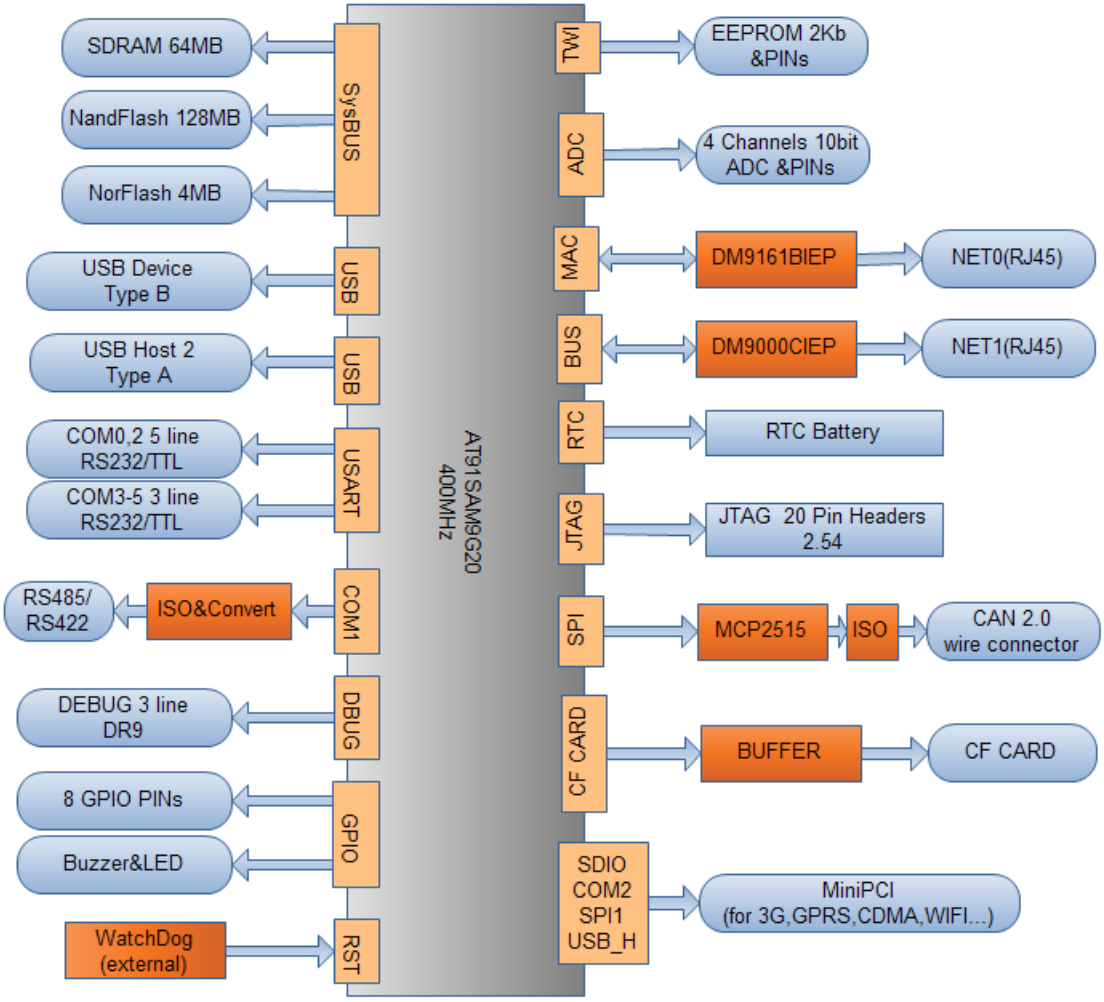
1.1 CPU

The Atmel AT91SAM9G20 is an ARM926EJ-S based High-performance 32-bit RISC Microcontroller with Thumb extensions, DSP Instruction Extensions, 32K Bytes Data Cache, 32K Bytes Instruction Cache, Write Buffer, MMU, 64K Bytes ROM, 32K Bytes SRAM, clock up to 400 MHz, USB 2.0 Full Speed Device Port, USB 2.0 Full Speed Host and Double Port, Ethernet MAC 10/100 Base T, External Bus Interface, Image Sensor Interface, Bus Matrix, System Controller, Reset Controller, Shutdown Controller, Clock Generator, Power Management Controller, Advanced Interrupt Controller, Debug Unit, Periodic Interval Timer, Watchdog Timer, Real-Time Timer, 4-channels 10-bit AD Converter, Three 32-bit PIO Controllers, 24-channel Peripheral DMA Controller, Two Slot Multimedia Card Interface, SSC, 4 * USART, 2 * Two Wire UART, 2 * SPI, Two 3-channel 16-bit Timer/Counters, TWI, IEEE 1149.1 JTAG Boundary Scan, 96 I/O Pins.

1.2 Functional interfaces

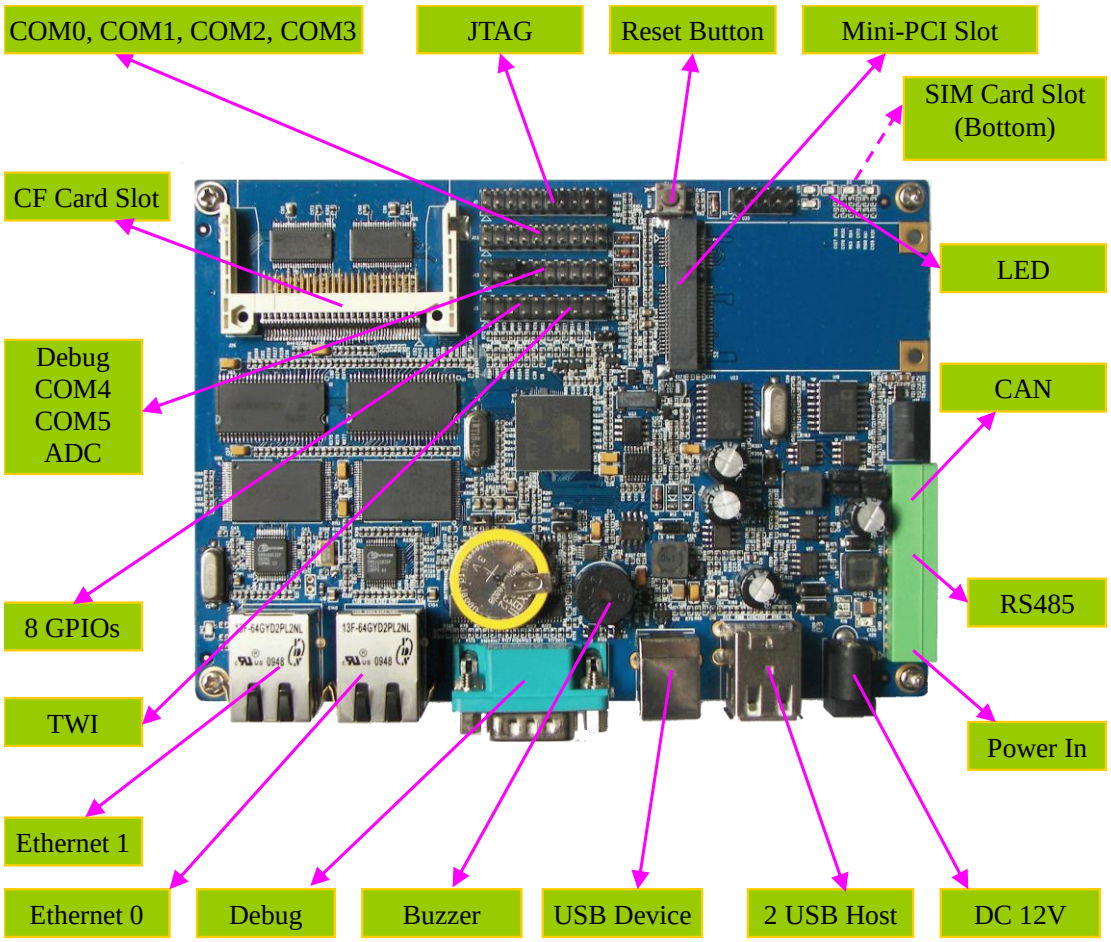
CLASS	FUNCTION	PARAMETER
Process	CPU	AT91SAM9G20,ARM926EJ-S,400MHz
RAM	SDRAM	64MB
ROM	NorFlash	4MB
	NandFlash	128MB
	EEPROM	2Kb
Communication	Usart	DEBUG：RS232（3 lines,can be used for communication）
		COM0：def RS232/TTL 5lines
		COM1：def RS485/RS422（ISO）RS232/TTL 5 lines
		COM2：def RS232/TTL 5 lines/integrate to MiniPCI
		COM3：def RS232/TTL 3lines
		COM4：def RS232/TTL 3lines
		COM5：def RS232/TTL/ 3lines
	CAN-Bus	1 CAN-Bus2.0 bus (data and power isolation)
	SPI	Integrate to MiniPCI connector
	MAC	10/100Mbps，DM9161BIEP
	EXT_NET	10/100Mbps，DM9000CIEP extended
	USB Host	2xUSB 2.0 Host, one integrate to MiniPCI connector
	USB Device	1xUSB 2.0 Device
Input	ADC	4 channels 10bit AD
MiniPCI	SDIO，SPI，UART，USB	Used for expanding 3G、GPS、GPRS/GSM、CDMA、WiFi/BT modules
Debug	JTAG	Debug connector
Memory	SDIO	Integrate to MiniPCI
	CF card	True IDE mode
Control	GPIO	8xGPIOs
Others	Reset	Hardware Reset Key
	Status indicator	GPIO
	Watch dog	External independent watchdog
	RTC	Backup battery power supply
	Power	8.4~15.6V input，12V default
	Buzzer	IO control

1.3 General system structure diagram



Chapter2 Description of interfaces

2.1 Interface of Layout



2.2 POWER（J14）

Configure DC jack connector（J4）and 3.81mm wiring devices（J14），power supply with DC 12V；

The power can be protected by fuse ,0.75A limited

+5V can be lead out from J14 0.5A Limited

J14（PIN1，2，3）definition

GND	1

VDD12(in)	2
VDD5V(out)	3

2.3 USART（J23,J13,J14）

USART adopt a common standard serial interface meet the needs of a variety of level combinations.

3 lines serial interface characteristics are as follows:

Signal input/output level: RS232
Maximum data rate: 115.2kbps
Flow Control: None
Connector: DR9 male/PINs

5 lines serial interface characteristics are as follows:

Signal input/output level: RS232
Maximum data rate: 115.2kbps
Flow Control: CTS, RTS
Connector: 2.54mm pitch connector

NO.	Function	Source	Pins	Description
1	DEBUG(3lines)	PB14，PB15	COM1 和 J13 (PIN7、9)	RS232 (default) TTL-level be configured by optional resistor
2	COM0(5lines)	PB4，PB5，PB26，PB27	J23 (PIN3、5、7、9）	RS232 (default) TTL-level be configured by optional resistor
3	COM1(5 lines)	PB6，PB7，PB28，PB29	J14 (PIN7、6)	RS485 (default) RS422 level（through jumper） TTL-level be configured by optional resistor or IC J23(11,13,15,17)
4	COM2(5 lines)	PB8，PB9，PA4，PA5	J23 (PIN2、4、6、8）	RS232 (default) TTL-level be configured by optional resistor
5	COM3(3 lines)	PB10，PB11	J23 (PIN12、14)	RS232 (default) TTL-level be configured by optional resistor
6	COM4(3 lines)	PA30，PA31	J13 (PIN3、5)	RS232 (default) TTL-level be configured by optional resistor

7	COM5(3 lines)	PB12，PB13	J13 (PIN4、6)	RS232 (default) TTL-level be configured by optional resistor

(Note: DEBUG port can be used as general USART ,Other usarts are lead out to pin headers 2.54mm)

J23 PINS definition：

GND	1	2	GND
RTXD0	3	4	RTXD2
RRXD0	5	6	RRXD2
RRTS0	7	8	RRTS2
RCTS0	9	10	RCTS2
RTXD1	11	12	RTXD3
RRXD1	13	14	RRXD3
RRTS1	15	16	VDD5V(NC)
RCTS1	17	18	VDD33(NC)
GND	19	20	GND

J13 PINS definition：

GND	1	2	GND
RTXD4	3	4	RTXD5
RRXD4	5	6	RRXD5
RRTXD	7	8	VDD5V
RRRXD	9	10	SHDN
GND	11	12	VDD33
VDD5V	13	14	VREFP
AVDD	15	16	AGND
PC0	17	18	PC1
PC2	19	20	PC3

J14 PINS definition：

CAN_H	10	
CAN_L	9	
GND_ISO	8	
485A	7	
485B	6	
485Z	5	
485Y	4	
VDD5V	3	Output(500mA)

VDD12V	2	Power input
GND	1	

2.4 RS485（J14）

The COM1 is RS485 serial port using isolating source and signal. Its controller is using the CPU internal RTS as enable end to control the communication in RS485 mode.So it can guarantee the communication accurately.

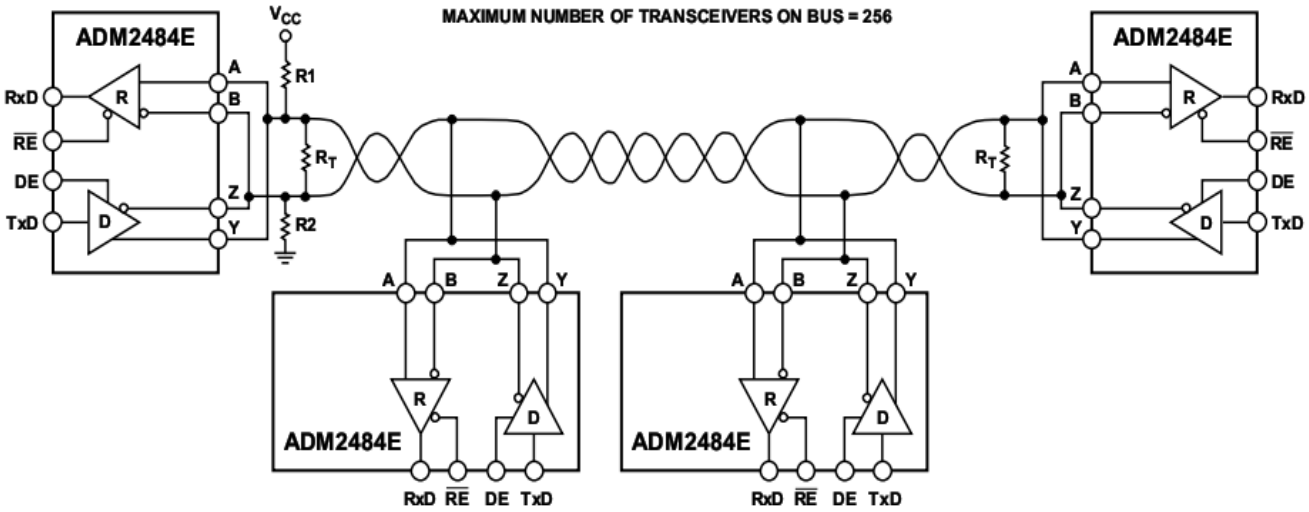
Output pins：J14

Pins（J14）	Net	description	description
8	GND_ISO	Iso gnd	Iso gnd
7	485A	RS485 mode	RS422 mode
6	485B		
5	485Z		
4	485Y		

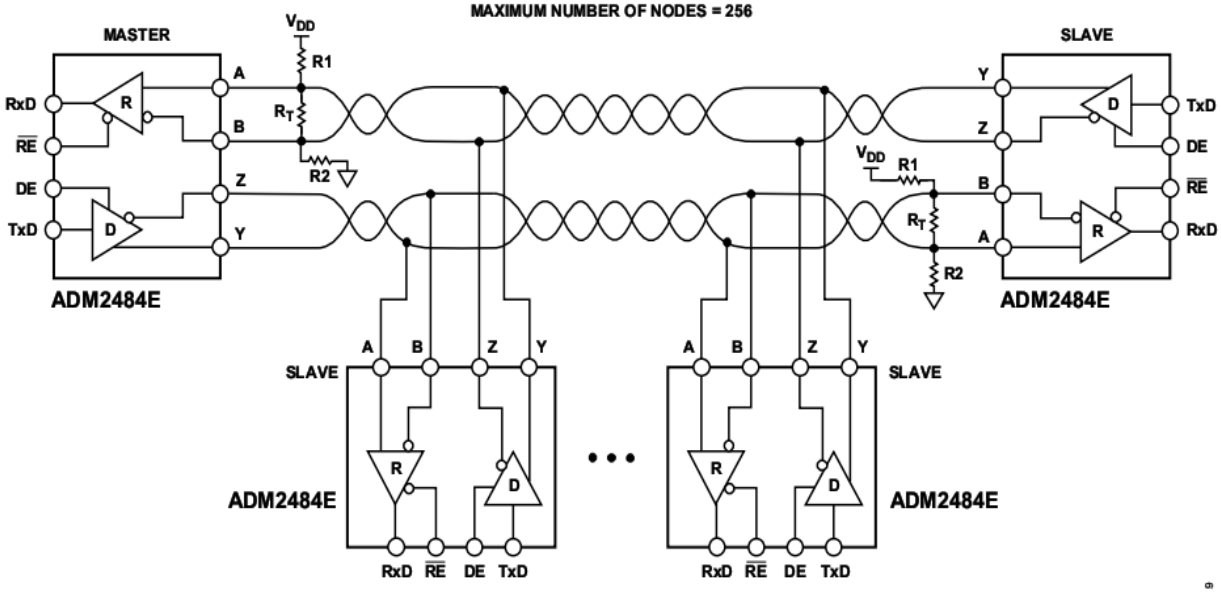
The board is using RS485 acquiescently; please connect 485A and 485B well through J5 and J6 jumpers. If it is terminal, please also connect J25 as terminal resistor. For middle device equipment, there is no need to connect J25. If customer needs to use RS422, you need to move the R33 resistor to R26 location, the pin definition will be as following: (Customer shall handling software themselves; Embest does not provide code for RS422.)

Mode	Item	Function		Mode	Item	Function
RS485 default	PB6	TXD		**RS422** (After change resistor）	PB6	TXD
	PB7	RXD			PB7	RXD
	PB28	RE/DE			PB28	DE
					PB29	RE

RS485 interface connection reference:



RS422 interface connection reference:



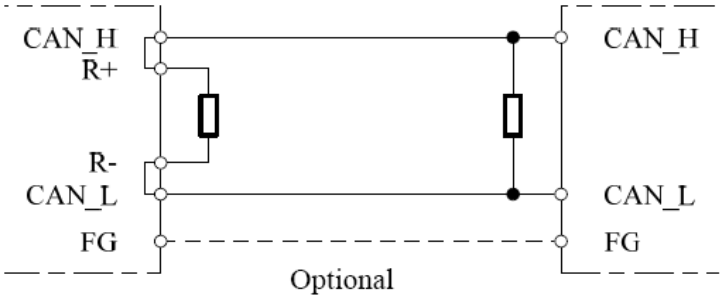
2.5 CAN （J14）

CAN2.0 is extended through MCP2515 and led out through connector J14. It is with isolated resource and digital signal isolator. It needs terminal matching resistor and connects to J24 jumper. Pin definition is as below:

Pin（J14）	Signal	Remark
10	CAN_H	

9	CAN_L	
8	GND_ISO	Isolate ground

Characteristic:
Supports CAN2.0B protocol
DC/DC power isolating module
magnetic isolating protection
Max communication speed is 1Mbp
Terminal resistor connection:



2.6 NET 0（J22）

Ethernet 0 is using the CPU built-in controller and externally connected to DM9161BIEP. It can realize DMA communication control in CPU and support transmitting data at 10/100M speed.
Ethernet with Led light (RJ45)
Interruption resource: PB16

2.7 NET1（J12）

Ethernet 1 is extended through DM9000CIEP and not supports DMA function. It supports transmitting data at 10/100M speed.

Ethernet with light (RJ45)

Interruption resource: PB25

2.8 USB HOST（J7）

Dual USB A type
USB 2.0 full speed (12Mbps)
Each USB port has 500mA current limitation

Resources: HDMA, HDPA, HDMB, HDPB
USB connector definition:

+5V	1	5	+5V
USBM0	2	6	USBM1
USBP0	3	7	USBP1
GND	4	8	GND

2.9 USB device（J9）

Standard Type B connector
Resources: DDP, DDM, PC5 (PC5 is judging signal when inserting devices)

Pin	Signal	Function
1	VBUS	Power supply (+5V)
2	D-	USB signal
3	D+	USB signal
4	GND	Power supply (GND)

2.10 ADC（J13）

The board has 4-channel 10bit ADC interface which use the CPU internal controller；
Resources:PC0，PC1，PC2，PC3；
Limited input voltage range: 0-3.3V；
J13（PIN17, 18, 19, 20）

2.11 CF CARD（J26）

Onboard standard CF card interface;
Work mode：True IDE；
Item NO.：J26。

2.12 JTAG（J2）

J2 pin definition

VDD33	1	2	VDD33
NTRST	3	4	GND
TDI	5	6	GND
TMS	7	8	GND
TCK	9	10	GND
RTCK	11	12	GND
TDO	13	14	GND
NRST	15	16	GND
	17	18	GND
	19	20	GND

2.13 GPIO（J3）

20PIN（10*2）pin headers connector，2.54mm(J3);
GPIO level:0V（low），3.3V（high）;
8 GPIOs come from CPU
8 IOs ports directly outgoing from AT91SAM9G20 have the following：
All of them can be configured as interruption mode
Input voltage：VIL=-0.3~0.8v，VIH=2~3.6v;
output voltage：Vol=<0.1v，VoH=2.9~3.3v;
Output curren：8mA;
User port：J3
Pin definition as follows：

PINS(J3)	Resource	PINS(J3)	Resource
1	PA25	2	PA29
3	PA26	4	PA22
5	PA27	6	PB21
7	PA28	8	PC9

2.14 Watch DOG

Onboard provide an external watchdog,it will output reset signal if it can not generate external clock，so it can be used to reset system when system hang

Resource：PB30（PCK0）。

When you debug the board please keep J10 open, or the watch dog will reset the board continuously.

When the system boot ,The software must output clocks to Watchdog;

Output pulse width: high 1.6S low 210mS。

2.15 BUZZ（BUZZ）

System provide a buzzer,it can be controlled by GPIO;

Resource：PB19（active low）

Item：BUZZ

2.16 TWI（J3）

System provide 2Kb EEPROM(U33)，TWI interface, and these 2 pins are lead out to J3,

It support two modes:master and slave

Resource: PA23（PIN11），PA24（PIN12）;

Mode:standard 100KHz and high speed 400KHz

2.17 MiniPCI（J15）

Onboard provide a MiniPCI connector,it can be used to extend other device.such as 3G、GPS、GPRS/GSM、CDMA、WiFi/BT module,the communications interface is as follows：

Function	Resource	Pins（J15）	Remarks
USB HOST	HDPA	38	Come from AT91SAM9G20
	HDMA	36	
USART	TX(PB8)	47	
	RX(PB9)	45	
	RTS(PA4)	49	
	CTS(PA5)	51	
SPI	SPI1_MISO(PB0)	43	
	SPI1_MOSI(PB1)	41	
	SPI1_SPCK(PB2)	39	
	SPI1_NPCS0(PB3)	37	
	DAT0(PA6)	7	

MCI	DAT1(PA9)	6	
	DAT2(PA10)	11	
	DAT3(PA11)	17	
	CMD(PA7)	5	
	CLK(PA8)	3	
GPIO	PB17	1	Wakeup the wireless device
	PB31	22	Reset，active low
SIM_CARD	VREG_USIM	8	Come from the SIMCARD on back of the board U22
	USIM_IO	10	
	USIM_CLK	12	
	USIM_RST	14	
HeadPhone	EAR_RN	31	The right headphone Connect to U35（PIN3）
	EAR_LP	33	Connect to U35（PIN4）
MIC	MIC_N	25	Connect to U35（PIN2）
	MIC_P	23	Connect to U35（PIN1）
POWER	VDD33_PCI	2,24,52	Use an independent power supply module +3.3V
	VDD5V	30，32	No connect，if need, you must welding the resistance R135
LED		42	Active low
GND	GND	4、9、15、18、21、26、27、29、34、35、40、50	
	STATE	20	10K pull down
NC		16、19、28、44、46、48	Not connect

Chapter3 Electrical Description

Power input：range（8.4~15.6V）suggestion 12V-2A
Kinds of power:+3.3V，+5V，+12V，+1.0V；
Power output port:12V 500 mA & 5V 500mA(12V comes from external DC)；
The USB Host can provide 5V-500mA for other USB device；
Actual test power consumption ：12V-0.15A；
Ambient temperature：-10-70℃。